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Clinical Research on the Improvement of Hemiplegic Gait Function through Acupoint Injection Combined with Task-Oriented Training

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Abstract: *Objective*: To explore the effect of acupoint injection combined with task-oriented training on the gait function of patients with hemiplegia. *Methods*: From January 2024 to December 2025, 90 patients with post-stroke hemiplegia admitted to the Rehabilitation Medicine Department of our hospital were selected and randomly divided into the observation group and the control group, with 45 cases in each group. The control group was given conventional rehabilitation combined with task-oriented training, while the observation group was additionally treated with acupoint injection at the Zusanli, Yanglingquan, Sanyinjiao, and Xuanzhong acupoints on the affected side. The intervention lasted for 4 weeks. The clinical efficacy, 10-meter walking time, walking speed, stride length, FMA-LE score, Berg score, and Barthel index of the two groups were compared. *Results*: The total effective rate of the observation group was 93.33%, which was higher than that of the control group (77.78%) ($p < 0.05$); after the intervention, the 10-meter walking time of the observation group decreased to 18.26 seconds, the walking speed increased to 0.57 m/s, and the stride length increased to 51.86 cm. *Conclusio*n: Acupoint injection combined with task-oriented training can improve the gait function of hemiplegia, and enhance lower limb motor control, balance ability and life activity ability.

Keywords: Acupoint injection; Task-oriented training; Hemiplegia; Gait function

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1. Introduction

Paralysis is a common manifestation of motor dysfunction after stroke and brain injury, with patients often

experiencing decreased lower limb muscle strength, weakened joint control, insufficient trunk stability, and abnormal gait patterns [1]. Impaired gait function not only affects the patient's ability to walk independently but also increases the risk of falls, reduces the level of daily activities, and delays the overall rehabilitation process [2,3]. Therefore, how to further improve the walking stability, lower limb coordination, and functional mobility of patients with paralysis after stroke on the basis of conventional rehabilitation is an important content in clinical rehabilitation treatment [4].

Task-oriented training emphasizes repetitive and goal-oriented training around actual life actions. Through tasks such as standing, center of gravity shift, stepping, crossing obstacles, and walking adjustment, it promotes patients' active participation and the reconstruction of movement patterns [5]. This training method can enhance lower limb weight-bearing control and gait adaptation ability, but the training effect is easily limited by some patients due to abnormal muscle tone, pain, local circulatory disorders, or insufficient neuromuscular excitability [6,7]. In stroke gait rehabilitation research, comprehensive intervention targeting walking ability, balance control, and motor function has been proven to have certain application value [8]. Acupoint injection combines drug stimulation with meridian regulation, and through local stimulation, meridian conduction, and drug action, it can improve the functional state of the affected limb, creating more favorable physical conditions for movement training.

Based on this, this study combined acupoint injection with task-oriented training to apply it in the rehabilitation of gait function for patients with paralysis. The study observed the effects on clinical efficacy, gait function, lower limb movement ability, balance ability, and daily living activity ability, aiming to provide a safe, operable, and clinically valuable comprehensive intervention idea for gait rehabilitation of patients with paralysis.

2. Methods

2.1. Research subjects and inclusion criteria

From January 2024 to December 2025, 90 patients with post-stroke paralysis who received treatment in the rehabilitation department of our hospital were selected as the research subjects. All patients were diagnosed by head CT or MRI, had unilateral motor dysfunction and varying degrees of gait abnormalities, stable vital signs, and could complete standing or walking training with assistance, and signed an informed consent form.

2.1.1. Inclusion criteria

Age 40–75 years; meeting the diagnostic criteria for post-stroke paralysis; disease course 2 weeks to 6 months; lower limb muscle strength grade II or above; clear consciousness, able to understand and cooperate with rehabilitation instructions.

2.1.2. Exclusion criteria

Patients with severe heart, liver, or kidney dysfunction; those with severe cognitive impairment, mental disorders, or aphasia affecting cooperation; those with lower limb fractures, joint deformities, or severe pain affecting training; those with skin infection at the injection site, abnormal coagulation function, or allergy to related drugs.

2.2. Randomization method and intervention process design

Using the random number table method, 90 patients were divided into the control group and the observation group, with 45 patients in each group. Before grouping, a dedicated person registered the age, gender, disease course, paralysis side, and initial gait function of the patients. The grouping results were confirmed by the rehabilitation therapist after the patients were enrolled, to reduce selection bias. The control group received conventional rehabilitation treatment combined with task-oriented training, and the observation group received additional acupoint injection intervention on the basis of the control group. Both groups were treated for 4 weeks, with 6 days of treatment per week. The training plan was formulated and completed status was recorded by the same rehabilitation team. During the intervention process, the vital signs, fatigue degree of the lower limbs, local injection reactions, and training tolerance of the patients were closely observed. If obvious discomfort occurred, the treatment was suspended and appropriate treatment was given. Gait function, lower limb movement function, balance ability, and daily living activity ability assessments were completed before and after the treatment.

2.3. Intervention plan for acupoint injection combined with task-oriented training

The control group received conventional rehabilitation therapy and task-oriented training, including joint movement of the affected lower limb, muscle strength induction, sitting-to-standing transfer, standing balance, center of gravity shift, step control, and walking on flat ground. During the training process, different task difficulties were set according to the patient's motor ability, such as fixed-point stepping, crossing low obstacles, turning walking, and target-distance walking. Each training session lasted 40 minutes and was conducted once a day. The observation group was additionally treated with acupoint injection therapy, selecting acupoints such as Zusanli, Yanglingquan, Sanyinjiao, and Xuanzhong on the affected side. The acupoints were disinfected conventionally and then injected with 0.5 mL of vitamin B12 solution, once every other day. During the treatment period, the training intensity was adjusted according to the patient's muscle tone, fatigue level, and gait stability to avoid excessive stretching and fatigue training. Both groups were continuously intervened for 4 weeks.

2.4. Observation indicators and statistical analysis methods

The observation indicators included clinical efficacy, gait function, lower limb motor function, balance ability, and daily living activity ability. Clinical efficacy was determined based on walking ability, control of the affected lower limb, and training completion status; gait function was evaluated using the 10 m walking test and changes in gait parameters; lower limb motor function was assessed using the Fugl-Meyer lower limb motor function score; balance ability was evaluated using the Berg balance scale; daily living activity ability was evaluated using the Barthel index. All indicators were measured before treatment and 4 weeks after treatment. Data were processed using SPSS 27.0 software. Quantitative data were expressed as mean ± standard deviation, and comparisons between groups were performed using *t*-tests; count data were expressed as the number of cases and percentages, and were analyzed using the χ^2 test. A p value < 0.05 indicated statistically significant differences.

3. Results

3.1. Comparison of baseline data of patients in different intervention groups

Before treatment, the general data and functional status of patients in the two groups were compared,

including age, gender, disease duration, side of hemiplegia, type of stroke, gait function, lower limb motor function, balance ability, and daily living activity ability. The comparison of baseline data of patients in different intervention groups is shown in **Table 1**. There were no statistically significant differences in age, gender composition, disease duration, side of hemiplegia, and type of stroke between the observation group and the control group ($p > 0.05$); there were also no significant differences in 10 m walking time, FMA-LE score, Berg score, and Barthel index before treatment ($p > 0.05$), indicating that the baseline levels of the two groups were similar and comparable.

Table 1. Comparison of baseline data of patients in different intervention groups

Project	Observation group(n = 45)	Control group(n = 45)	t/χ^2 value	p value
Age (years)	61.42 ± 7.36	60.87 ± 7.81	0.344	0.732
Gender (male/female, cases)	26/19	24/21	0.178	0.673
Duration of illness (days)	48.26 ± 15.34	50.18 ± 16.07	0.580	0.564
Side of hemiplegia (left/right, cases)	22/23	24/21	0.178	0.673
Type of stroke (ischemic/hemorrhagic, cases)	31/14	29/16	0.198	0.656
10 m walking time (seconds)	28.64 ± 5.37	29.18 ± 5.62	0.466	0.642
FMA-LE score (points)	20.46 ± 4.28	19.97 ± 4.35	0.538	0.592
Berg score (points)	31.52 ± 5.46	30.84 ± 5.73	0.576	0.566
Barthel index (points)	53.18 ± 7.64	52.46 ± 7.82	0.442	0.660

Note: Quantitative data are presented as mean ± standard deviation, and comparisons between groups are conducted using *t*-test; Count data are expressed as the number of cases, and comparisons between groups are conducted using χ^2 test. $p < 0.05$ indicates statistically significant differences.

3.2. Clinical efficacy analysis of acupoint injection combined with task-oriented training

After 4 weeks of treatment, the clinical efficacy was determined based on the recovery of the patient's walking ability, improvement of the control of the affected lower limb, completion of training tasks, and participation in daily activities. Marked improvement indicated that the patient's gait stability significantly improved and could complete functional tasks such as continuous walking, turning, and center of gravity transfer well; Effective indicated that the walking ability and lower limb control improved compared to before treatment, but still required certain assistance; Ineffective indicated that the improvement of related functions was not significant. Comparison of clinical efficacy among different intervention groups is shown in **Table 2**.

Table 2. Comparison of clinical efficacy among different intervention groups

Group	Number of cases	Efficacy	Effective	Unresponsive	Total efficacy rate
Observation group	45	29 (64.44%)	13 (28.89%)	3 (6.67%)	42 (93.33%)
Control group	45	20 (44.44%)	15 (33.33%)	10 (22.22%)	35 (77.78%)

Note: Total effective rate = (marked improvement cases + effective cases) / total cases × 100%; Comparison of total effective rates between the two groups, $\chi^2 = 4.406$, $p = 0.036$.

From **Table 2**, it can be seen that the total effective rate of the observation group was 93.33%, higher than that of the control group (77.78%), and the difference was statistically significant ($p < 0.05$). This indicates that combining acupoint injection with task-oriented training can further improve the overall

treatment effect of gait rehabilitation in patients with hemiplegia.

3.3. Improvement of gait function in patients with hemiplegia before and after intervention

Before treatment, there were no significant differences in the main gait indicators such as 10 m walking time, walking speed, and stride length between the two groups, suggesting that the basic level of gait function of the two groups was similar. After 4 weeks of treatment, the gait indicators of both groups improved compared to before treatment, and the improvement in the observation group was more significant [9]. The 10 m walking time of the observation group decreased from 28.64 s to 18.26 s, a reduction of 36.24%; the control group decreased from 29.18 s to 23.74 s, a reduction of 18.64%. At the same time, the walking speed of the observation group increased from 0.35 m/s to 0.57 m/s, and the stride length increased from 38.42 cm to 51.86 cm, both better than the post-treatment level of the control group. This indicates that acupoint injection combined with task-oriented training can play an active role in improving the control of lower limb weight-bearing, gait rhythm, and continuous walking ability. **Figure 1** shows the changes in the main gait indicators of the two groups before and after intervention.

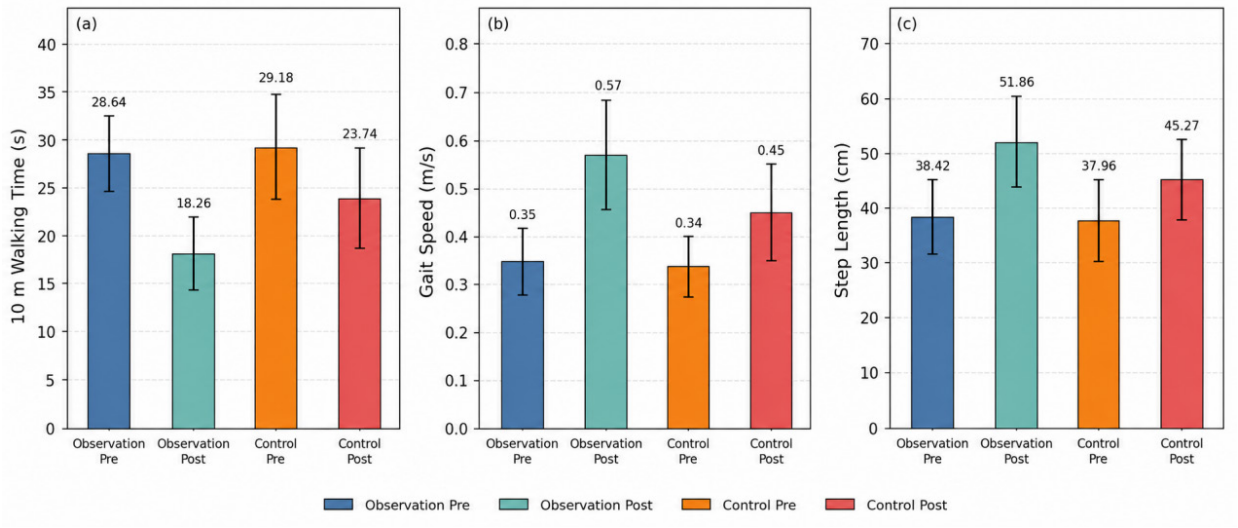

Figure 1. Changes in main gait indicators before and after intervention.

As shown in **Figure 1**, the observation group outperformed the control group in terms of shorter walking time of 10 meters, increased walking speed and increased stride length. This indicates that the combined intervention has a more significant promoting effect on the recovery of gait function in patients with hemiplegia.

3.4. Changes in lower limb motor function, balance ability and daily living activity ability

After 4 weeks of treatment, the lower limb motor function, balance ability and daily living activity ability of both groups improved compared to before treatment, but the improvement in the observation group was more significant. The FMA-LE score of the observation group increased from 20.46 ± 4.28 points to 33.28 ± 5.16 points, while that of the control group increased from 19.97 ± 4.35 points to 29.16 ± 5.02 points, suggesting that the combined intervention had a more significant effect on the recovery of separated movement, joint

control and coordinated activities of the affected lower limbs. In terms of Berg score, the observation group increased from 31.52 ± 5.46 points to 45.36 ± 6.18 points, while the control group increased from 30.84 ± 5.73 points to 39.25 ± 6.04 points, indicating that the observation group had more comprehensive improvements in standing stability, center of gravity transfer and dynamic balance control. In terms of Barthel index, the observation group increased from 53.18 ± 7.64 points to 76.42 ± 8.35 points, while the control group increased from 52.46 ± 7.82 points to 67.15 ± 8.06 points, indicating that after the improvement of gait function and lower limb control ability, patients gained more direct functional benefits in transfer, walking, toileting and daily self-care. To further present the differences in different outcome indicators between the groups, this study used a forest plot to display the improvement advantage of the observation group compared to the control group, as shown in **Figure 2**.

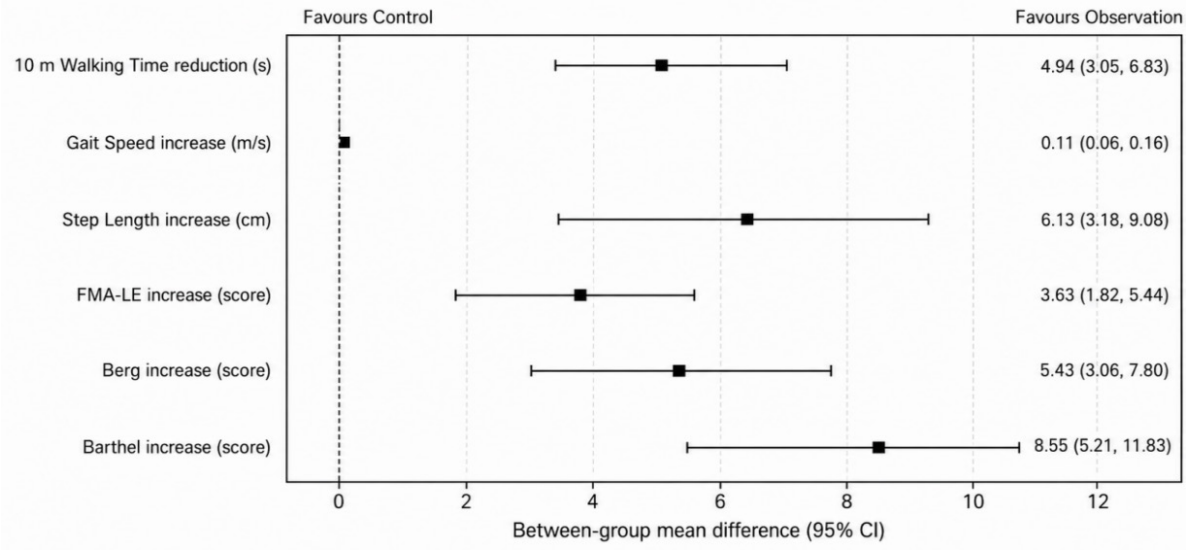

Figure 2. Forest plot of inter-group differences in the main outcome indicators.

As shown in **Figure 2**, the observation group performed better than the control group in terms of 10-meter walking time reduction, increased walking speed, increased stride length, improved FMA-LE score, improved Berg score, and improved Barthel index. The mean difference in Barthel index improvement between the groups was 8.55 points, with a 95% confidence interval of 5.21 to 11.83; the mean difference in Berg score improvement was 5.43 points, with a 95% confidence interval of 3.06 to 7.80. This suggests that the combined intervention not only improves gait performance but also promotes overall functional recovery.

To analyze the relationship between gait improvement and lower limb movement recovery, a scatter plot of the change values of FMA-LE score and the improvement values of walking speed was further drawn, as shown in **Figure 3**.

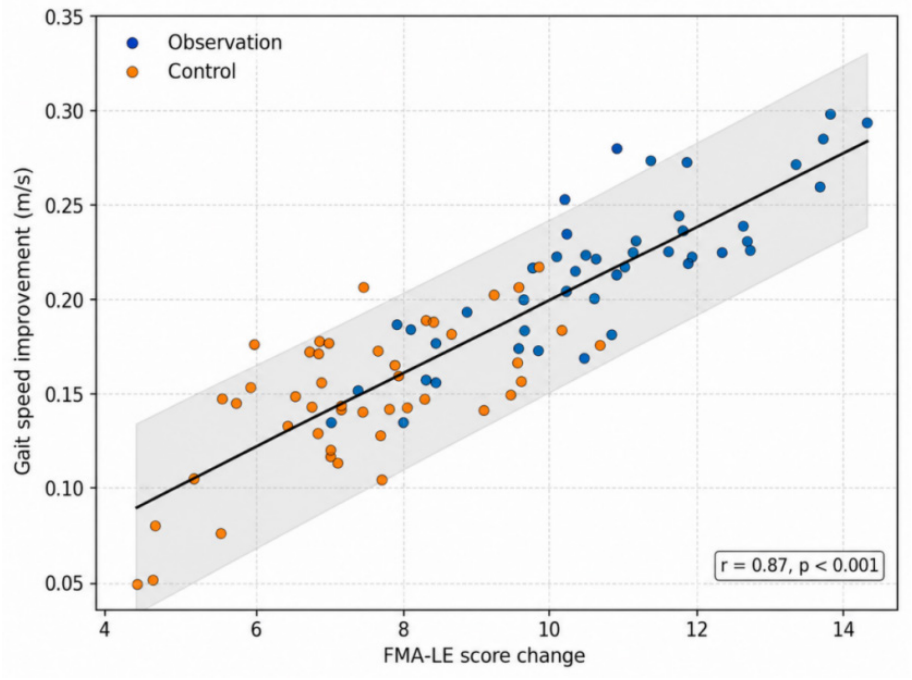

Figure 3. Scatter plot of the correlation between gait function improvement and lower limb motor recovery.

As shown in **Figure 3**, the change value of FMA-LE score was significantly positively correlated with the improvement value of gait speed, with a correlation coefficient of $r = 0.87$ and $p < 0.001$. This indicates that the more obvious the recovery of lower limb motor control, the more sufficient the improvement of gait speed. It also suggests that acupoint injection combined with task-oriented training may further promote the recovery of gait function in hemiplegic patients by improving the active control and balance regulation ability of the affected side lower limb.

4. Discussion

The gait dysfunction in hemiplegic patients is often related to decreased muscle strength on the affected side, abnormal muscle tone, insufficient joint control, and weakened balance regulation ability [10]. Although passive activities or conventional training can maintain joint range of motion and basic motor ability to some extent, they have limited improvement in walking rhythm, weight transfer, and walking adaptability in complex environments. The results of this study show that the total effective rate of the observation group is higher than that of the control group, and after treatment, the 10-meter walking time is shortened, gait speed is increased, and stride length is increased. This indicates that acupoint injection combined with task-oriented training can more effectively promote the recovery of gait function in hemiplegic patients.

Task-oriented training is based on actual gait movements as the core, integrating movements such as sitting-to-standing transfer, center of gravity control, stepping, turning, and continuous walking into the training process. This can enhance the patient's active participation and enable the affected side lower limb to gradually form a stable motor output in repetitive functional tasks. Acupoint injection improves the sensory input, muscle excitability, and local circulation state of the affected side limb through local stimulation of Zusanli, Yanglingquan, Sanyinjiao, and Xuanzhong acupoints, which helps alleviate stiffness and insufficient

movement control during training. The combination of these two methods forms a complementary effect between peripheral stimulation and active movement training, providing more continuous rehabilitation stimulation for gait pattern reconstruction.

From the comprehensive functional results, the FMA-LE, Berg score, and Barthel index of the observation group improved more than those of the control group, suggesting that gait improvement is not an isolated change but is closely related to the improvement of lower limb motor control, balance ability, and daily living ability [11,12]. Correlation analysis also shows that the change value of FMA-LE score is positively correlated with the improvement value of gait speed, indicating that the better the active control ability of the affected side lower limb, the more significant the improvement in walking efficiency. Thus, the combined intervention not only focuses on "whether one can walk" but also improves the stability and practicality of the patient's walking process [13].

This study still has certain limitations. The sample size is relatively small, and the observation period is only 4 weeks. The long-term effect on gait maintenance and recurrence risk have not been tracked. At the same time, there is still room for further optimization of the types of acupoint injection drugs, doses, and acupoint combinations. In the future, a larger sample size can be expanded, the follow-up time can be prolonged, and combined with three-dimensional gait analysis and electromyography detection, the mechanism of action can be further verified from the perspective of movement biomechanics.

5. Conclusion

The results of this study indicate that combining acupoint injection with conventional rehabilitation and task-oriented training can further improve the gait function of hemiplegic patients after stroke. The total effective rate of the observation group after treatment is 93.33%, the 10-meter walking time is shortened to 18.26 seconds, gait speed is increased to 0.57 m/s, and stride length is increased to 51.86 cm. The FMA-LE, Berg score, and Barthel index also improve more significantly. This indicates that the combined intervention can enhance the active control of the affected side lower limb, improve standing balance and walking stability, and promote the recovery of daily living ability. In the future, a larger sample size and longer follow-up can be conducted to further verify its long-term effect.

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Disclosure statement

The authors declare no conflict of interest.

References

[1] Feigin V, Brainin M, Norrving B, et al., 2022, World Stroke Organization (WSO): Global Stroke Fact Sheet 2022. International Journal of Stroke, 17(1): 18–29.

[2] Van Criekinge T, Heremans C, Burridge J, et al., 2024, Standardized Measurement of Balance and Mobility Post-stroke: Consensus-based Core Recommendations from the Third Stroke Recovery and Rehabilitation Roundtable. International Journal of Stroke, 19(2): 158–168.

[3] Sütçü G, Özçakar L, Yalçın A, et al., 2023, Bobath vs. Task-oriented Training After Stroke: An Assessor-blind Randomized Controlled Trial. Brain Injury, 37(7): 581–587.

[4] Ibrahim R, Abdullahi A, Salihu A, et al., 2025, Intensity of Task-specific Training for Functional Ability Post-stroke: Systematic Review and Meta-analysis. Clinical Rehabilitation, 39(9): 1133–1155.

[5] Ghrouz A, Guillen-Sola A, Morgado-Perez A, et al., 2024, The Effect of a Motor Relearning on Balance and Postural Control in Patients After Stroke: An Open-label Randomized Controlled Trial. European Stroke Journal, 9(2): 303–311.

[6] Do J, Lim W, Kim D, et al., 2024, Effects of High-intensity Interval Robot-assisted Gait Training on Cardiopulmonary Function and Walking Ability in Chronic Stroke Survivors: A Multicenter Single-blind Randomized Controlled Trial. Journal of Back and Musculoskeletal Rehabilitation, 37(5): 1309–1319.

[7] Tapp A, Griswold D, Dray D, et al., 2024, High-intensity Locomotor Training During Inpatient Rehabilitation Improves the Discharge Ambulation Function of Patients with Stroke: A Systematic Review with Meta-analysis. Topics in Stroke Rehabilitation, 31(5): 431–445.

[8] Tanaka N, Ebihara K, Ebata Y, et al., 2022, Effect of Gait Rehabilitation with a Footpad-type Locomotion Interface on Gait Ability in Subacute Stroke Patients. NeuroRehabilitation, 50(4): 401–407.

[9] Nindorera F, Nduwimana I, Thonnard J, et al., 2022, Effectiveness of Walking Training on Balance, Motor Functions, Activity, Participation and Quality of Life in People with Chronic Stroke: A Systematic Review with Meta-analysis and Meta-regression of Recent Randomized Controlled Trials. Disability and Rehabilitation, 44(15): 3760–3771.

[10] Moreno-Segura N, Martín-San Agustín R, García-Bafalluy S, et al., 2022, Effects of Core Training on Trunk Function, Balance, and Gait in Stroke Patients: A Systematic Review and Meta-analysis of Randomised Controlled Trials. Clinical Rehabilitation, 36(12): 1635–1654.

[11] Menezes-Oliveira E, Dos Anjos S, De Oliveira C, et al., 2024, Improvement of Gait and Balance Function in Chronic Post-stroke Patients Induced by Lower Extremity-Constraint Induced Movement Therapy: A Randomized Controlled Clinical Trial. Brain Injury, 38: 559–568.

[12] Nayak N, Mahendran N, Kuys S, et al., 2024, What Factors at Discharge Predict Physical Activity and Walking Outcomes 6 Months After Stroke? A Systematic Review. Clinical Rehabilitation, 38(10): 1393–1403.

[13] Khan M, Maag L, Harnegie M, et al., 2024, The Effects of Cycling on Walking Outcomes in Adults with Stroke: A Systematic Review. Topics in Stroke Rehabilitation, 31(3): 259–271.